A MESH-INDEPENDENT SPOT WELD CAPABILITY FOR CRASHWORTHINESS

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Effective modeling of spot welds is critical to system analysis of crashworthiness and other automotive applications. The approach adopted in this paper utilizes a mesh-independent connection technique, which incorporates the latest modeling trends in vehicle sub-system and system analysis. The spot weld connection is completely independent of the connected components and results are reasonably independent of the mesh density. The definition of the spot weld is automated.

The mesh-independent spot weld consists of distributed coupling constraints that connect the surface to attachment points, which are subsequently connected by a standard kinematic constraint method. A failure model with accumulated damage may be used to weaken or fail the kinematic constraint between attachment points. The spot weld can connect any number of component layers, does not create additional constraints on the surface of components, and can transfer in-plane twist between components without regard to the drill formulation of the underlying structural elements. Furthermore, the spot weld does not use artificial penalty factors or affect time increment stability in an explicit dynamics procedure.

Aspects of the theory and user interface will be discussed. Small and large-scale examples, including a full vehicle crash simulation, will be presented illustrating the usefulness of this connection modeling technique.